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(54) INK JET PRINTING, PRINTING APPARATUS, INK SET FOR PRINTING AND PRINTED PRODUCT

(57)Abstract:

PROBLEM TO BE SOLVED: To form stable image excellent in coloring properties in a region from violet to blue by ink jet printing method and spread expression range of color tone and chroma.

SOLUTION: Ink is prepared using at least one kind of dye selected from CI disperse violet 26, 28, 40, 43, 48, 57, 63, 77, 87 and 97 as violet-based ink and using at least one kind of dye selected from CI disperse blue 56, 73, 79: 1, 113, 128, 148, 154, 158, 165, 165:1, 165:2, 183, 194, 201, 214, 222, 225, 257, 266, 267, 287, 358 and 368 as blue-based ink and each using a dividing agent and an aqueous medium. The ink is applied to a polyester fiber fabric so that two color inks are jetted at a discharge speed of 5-20m/sec from a recording head housed in a cartridge through heat energy so as to superpose at least a part of two color inks and the fabric is heat-treated by steaming or thermosol method and cleaned to provide the objective ink jet printed product.

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## CLAIMS

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### [Claim(s)]

[Claim 1] It is the approach of printing by an ink jet method giving the ink of violet and two blue colors on a textile at least. (a) The process which gives the ink of said two colors on a textile so that at least a part may lap, (b) The process which heat-treats the textile to which said ink was given, the process which washes the textile which carried out the (c) aforementioned heat treatment, Have \*\* 3 process at least and said textile contains the fiber which can be dyed by the disperse dye. Said each of ink contains at least coloring matter, the compound with which this coloring matter is distributed, and an aqueous solvent object. A kind of coloring matter chosen from the group which said violet ink becomes from the C.I. De Dis parsing violet 26-28-40-43-48-57-63-77-87-97 is contained at least. Said blue ink C. I. De Dis parsing blue 56, 73, and 79: At least a kind of coloring matter chosen from the group which consists of 1-113-128-148-154-158-165-165:1-165:2-183-197-201-214-224-225-257-266-267-287-358-368 The ink jet textile-printing approach characterized by containing.

[Claim 2] The ink jet textile-printing approach according to claim 1 that a textile contains polyester fiber as fiber which can be dyed by the disperse dye.

[Claim 3] The ink jet textile-printing approach according to claim 1 or 2 that heat treatment of a process (b) is an elevated-temperature steaming method (the HT steaming method) or a thermosol process.

[Claim 4] The ink jet textile-printing approach according to claim 1, 2, or 3 that an ink jet method is an ink jet method which makes ink breathe out using heat energy.

[Claim 5] The ink jet textile-printing approach given in any 1 term of claims 1-4 whose regurgitation rates of ink are 5 - 20 m/sec.

[Claim 6] The ink jet textile-printing approach given in any 1 term of claims 1-5 which pretreat a textile before a process (a).

[Claim 7] The ink set for textile printing which is used for an approach given in any 1 term of claims 1-6 and which contains violet ink and blue ink at least.

[Claim 8] The textile-printing object printed by the approach given in any 1 term of claims 1-6.

[Claim 9] It is the textile-printing object with which the coloring matter of violet and two blue colors is printed in the condition of having overlapped in part at least. As being chosen out of the group which said violet coloring matter becomes from the C.I. De Dis parsing violet 26-28-40-43-48-57-63-77-87-97, a kind is contained as it is few. Said blue coloring matter C.I. De Dis parsing blue 56, 73, and 79: As being chosen out of the group which consists of 1-113-128-148-154-158-165-165:1-165:2-183-197-201-214-224-225-257-266-267-287-358-368, a kind is contained as it is few. And said textile-printing object The textile-printing object characterized by being printed by the textile containing the fiber which can be dyed by the disperse dye.

[Claim 10] The textile-printing object according to claim 9 which is that in which a textile contains polyester fiber as fiber which can be dyed by the disperse dye.

[Claim 11] The workpiece which processed the textile-printing object according to claim 8, 9, or 10, and was obtained.

[Claim 12] The record unit used for an approach given in any 1 term of claims 1-6 equipped with the ink hold section which held ink, and the recording head for making ink breathe out as an ink

droplet.

[Claim 13] The record unit according to claim 12 whose recording head is a recording head which makes heat energy act on ink and makes an ink droplet breathe out.

[Claim 14] The ink cartridge used for an approach given in any 1 term of claims 1–6 equipped with the ink hold section which held ink.

[Claim 15] Ink jet textile–printing equipment used for an approach given in any 1 term of claims 1–6 which equipped said recording head with the ink feed zone for supplying ink from the recording head for carrying out the regurgitation of the ink, the ink cartridge which has the ink hold section which held ink, and this ink cartridge.

[Claim 16] Ink jet textile–printing equipment according to claim 15 whose recording head is a recording head which makes heat energy act on ink and makes an ink droplet breathe out.

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**DETAILED DESCRIPTION**

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the ink jet textile-printing approach, textile-printing equipment, the ink set for textile printing, and a textile-printing object.

[0002]

[Description of the Prior Art] The mainstream of current and textile printing is screen printing and roller printing. However, since these methods are unsuitable for limited production with a wide variety and the prompt action to an epidemic is also difficult, recently, establishment of a non-engraved electronic textile-printing system is demanded.

[0003] To this want, many textile-printing approaches by the ink jet method are proposed, and the expectation from every direction is also large.

[0004] giving sufficient concentration for (1) coloring as a technical problem of the conventional ink jet textile-printing approach, that the percentage exhaustion to the textile of (2) coloring matter is high, and the waste water treatment after a washing process is easy, that the irregular blot by the color mixture between unique is not conspicuous on (3) textiles, that the range of (4) color reproduction is wide, and (5) — it is mentioned that the always stabilized production is possible etc.

[0005] In order to satisfy these technical problems, in the former, add various additives mainly to ink, the amount of placing of ink is operated, or it has corresponded [ processing beforehand to a textile, etc. and ].

[0006] Moreover, the approach sublimation temperature uses a disperse dye 180 degrees C or more is indicated as the ink jet textile-printing approach for the textile which prints using a disperse dye, for example, a polyester textile, (JP,61-118477,A).

[0007]

[Problem(s) to be Solved by the Invention] However, although good coloring is shown when ink using the disperse dye which paid its attention only to sublimation temperature as coloring matter prints, and each ink is made to dye independently When color mixture of the ink is carried out on a textile, with the combination of the color to be used In order for the repeatability when dyeing repeatedly on the concentration after dyeing, a color tone, and the same dyeing conditions to get very bad, to stop filling simultaneously above-mentioned technical-problem (1) —(4) — (5) etc. in many cases and to perform various color expressions, the approach of starting was inadequate.

[0008] Therefore, it was impossible various kinds of demand items mentioned above and to especially have filled a technical problem (5) fully only at the Prior art.

[0009] Moreover, in order for how far the size of the color reproduction range of the above-mentioned technical problem (4) can be taken out to spread the ink jet textile-printing approach widely, it is important. Because, in the conventional textile printing, in order to carry out color mixture of the ink on a textile by textile printing by the ink jet method to the color of very many color tones having been freely employable since printing paste was prepared for every color and to obtain the variation of a color, the color of the ink to be used will be restricted to some kinds.

[0010] On the ink jet print to recorded materials, such as the conventional paper, the three primary colors of yellow Magenta cyanogen expressed all the colors with subtractive color mixture in many cases. However, in ink jet textile printing, when printing using the ink which contains a disperse dye to a textile which makes polyester a subject, especially the color repeatability of a violet system to a blue system was not able to express about the same conventional color tone or saturation as textile printing only by the technique by the color mixture of a Magenta and cyanogen.

[0011] Although invention to the above-mentioned technical problem is indicated by JP,7-26476,A, it is more rich and amplification (it is hard to express to a numeric value) of the color repeatability of a violet system to a deep blue system is demanded further.

[0012] Then, the thing for which an above-mentioned problem is solved in case the object of this invention carries out ink jet textile printing of the fiber which can be dyed by the disperse dye at the textile constituted as a subject, even if the color reproduction range especially applied to a blue system from a violet system can be markedly alike as compared with the conventional technique, it can obtain a large textile-printing object and the dyeing processing conditions by heating change somewhat further, it is offering the ink jet textile-printing approach with sufficient repeatability a stable image's being obtained. Moreover, it is offering the ink jet textile-printing equipment used for this approach, the ink set for textile printing, and a textile-printing object.

[0013]

[Means for Solving the Problem] this invention persons completed this invention, as a result of repeating various examination, in order to attain the above-mentioned object.

[0014] The 1st invention at least the ink of violet and two blue colors It is the approach of printing by an ink jet method giving on a textile. (a) The process which gives the ink of said two colors on a textile so that at least a part may lap, (b) The process which heat-treats the textile to which said ink was given, the process which washes the textile which carried out the (c) aforementioned heat treatment, Have \*\* 3 process at least and said textile contains the fiber which can be dyed by the disperse dye. Said each of ink contains at least coloring matter, the compound with which this coloring matter is distributed, and an aqueous solvent object. A kind of coloring matter chosen from the group which said violet ink becomes from the C.I. De Dis parsing violet 26-28-40-43-48-57-63-77-87-97 is contained at least. Said blue ink C. I. De Dis parsing blue 56, 73, and 79: At least a kind of coloring matter chosen from the group which consists of 1-113-128-148-154-158-165-165:1-165:2-183-197-201-214-224-225-257-266-267-287-358-368 It is related with the ink jet textile-printing approach characterized by containing.

[0015] The 2nd invention relates to the ink jet textile-printing approach of the 1st invention that a textile contains polyester fiber as fiber which can be dyed by the disperse dye.

[0016] The 3rd invention relates to the 1st whose heat treatment of a process (b) is an elevated-temperature steaming method (the HT steaming method) or a thermosol process, or the ink jet textile-printing approach of the 2nd invention.

[0017] The 4th invention relates to the 1st whose an ink jet method is an ink jet method which makes ink breathe out using heat energy, the 2nd, or the ink jet textile-printing approach of the 3rd invention.

[0018] The 5th invention relates to the ink jet textile-printing approach of the 1st - one of invention of the 4th that the regurgitation rate of ink is 5 - 20 m/sec.

[0019] The 6th invention relates to the ink jet textile-printing approach of the 1st which pretreats a textile before a process (a) - one of invention of the 5th.

[0020] The 7th invention relates to the ink set for textile printing which is used for the approach of the 1st - one of invention of the 6th and which contains violet ink and blue ink at least.

[0021] The 8th invention relates to the textile-printing object printed by the approach of the 1st - one of invention of the 6th.

[0022] The 9th invention is a textile-printing object with which the coloring matter of violet and two blue colors is printed in the condition of having overlapped in part at least. As being chosen out of the group which said violet coloring matter becomes from the C.I. De Dis parsing violet 26-28-40-43-48-57-63-77-87-97, a kind is contained as it is few. Said blue coloring matter C.I.

De Dis parsing blue 56, 73, and 79: As being chosen out of the group which consists of 1-113-128-148-154-158-165-165:1-165:2-183-197-201-214-224-225-257-266-267-287-358-368, a kind is contained as it is few. And said textile-printing object It is related with the textile-printing object characterized by being printed by the textile containing the fiber which can be dyed by the disperse dye.

[0023] The 10th invention is the textile-printing object of the 9th invention which is that in which a textile contains polyester fiber as fiber which can be dyed by the disperse dye.

[0024] The 11th invention relates to the workpiece which processed the 8th, the 9th, or the textile-printing object of the 10th invention, and was obtained.

[0025] The 12th invention relates to the record unit used for the approach of the 1st [ equipped with the ink hold section which held ink, and the recording head for making ink breathe out as an ink droplet ] – one of invention of the 6th.

[0026] The 13th invention relates to the record unit of the 12th invention whose recording head is a recording head which makes heat energy act on ink and makes an ink droplet breathe out.

[0027] The 14th invention relates to the ink cartridge used for the approach of the 1st [ equipped with the ink hold section which held ink ] – one of invention of the 6th.

[0028] The 15th invention relates to the ink jet textile-printing equipment used for the approach of the 1st which equipped said recording head with the ink feed zone for supplying ink – one of invention of the 6th from the recording head for carrying out the regurgitation of the ink, the ink cartridge which has the ink hold section which held ink, and this ink cartridge.

[0029] The 16th invention relates to the ink jet textile-printing equipment of the 15th invention whose recording head is a recording head which makes heat energy act on ink and makes an ink droplet breathe out.

[0030]

[Embodiment of the Invention] Hereafter, this invention is explained to a detail.

[0031] The textile used in this invention contains the fiber which can be dyed by the disperse dye. As fiber which can be dyed by the disperse dye, what consists of polyester, acetate, triacetate, etc. is desirable. What consists of polyester especially is desirable. These fiber can use textiles, knitting, a nonwoven fabric, etc. with any gestalt.

[0032] Although the thing of 100% of fiber which can be dyed by the disperse dye is suitable for the textile used for this invention, if it is 50% or more preferably, mixed textile fabrics or a mixed nonwoven fabric with the textile which consists of fiber which can be dyed by the disperse dye, and other raw materials, for example, rayon, cotton, polyurethane, an acrylic, NAION, wool, silk, etc. can be used as a textile for textile printing of this invention 30% or more of blending ratios.

[0033] Although that whose blending ratio of the fiber which can be dyed by the disperse dye is 100% is suitable for the textile used for the approach of this invention, if a blending ratio is 50% or more preferably, it can use mixed textile fabrics or a mixed nonwoven fabric of the fiber which can be dyed by the disperse dye, and other raw materials etc. 30% or more. As other raw materials, rayon, cotton, polyurethane, an acrylic, nylon, wool, silk, etc. are mentioned, for example.

[0034] The textile used by the approach of this invention may perform well-known pretreatment conventionally if needed. using the processing liquid (for example, water solution) which contained the urea, the water soluble polymer, the water-soluble metal salt, etc. 0.01 to 20% of the weight especially — it is desirable. A textile is dipped in this processing liquid and dried after dehydration.

[0035] As an example of the above-mentioned water soluble polymer, well-known natural water solubility macromolecules, such as protein matter, such as polysaccharide, such as cellulose type matter, such as starch matter, such as corn and wheat, and carboxymethyl-cellulose methyl cellulose hydroxyethyl cellulose, and a sodium alginate gum Arabic locust-bean-gum tolan TOGAMU guar gum tamarind seed, and gelatin casein, and tannin system matter, lignin system matter, are mentioned. Moreover, as an example of synthetic macromolecule, a well-known polyvinyl alcohol system compound, a polyethylene oxide system compound, an acrylic-acid system water soluble polymer, a maleic-anhydride system water soluble polymer, etc. are mentioned, for example. A polysaccharide system macromolecule and a cellulose type

macromolecule are desirable also in these.

[0036] As the water-soluble above-mentioned metal salt, for example like the halogenide of alkali metal or alkaline earth metal, typical ionic crystal is formed and the compound which can be adjusted to pH 4-10 is mentioned. as the typical example of such a compound — alkali metal — NaCl and Na<sub>2</sub> — SO<sub>4</sub>, KCl, CH<sub>3</sub>COONa, etc. are mentioned and CaCl<sub>2</sub> and MgCl<sub>2</sub> grade are mentioned as an alkaline earth metal. Especially, the salts of Na, K, and calcium are desirable.

[0037] Next, the violet and the blue coloring matter which are contained in the ink used for this invention are explained. This invention is mainly characterized by this.

[0038] According to the subtractive-color-mixture method expressed with conventional yellow Magenta cyanogen, the hue of a violet system to a blue system can be covered by controlling each of two ink, a Magenta and cyanogen. However, the ink which contains the blue coloring matter which is difficult and has [ the time of expressing violet with high saturation and ] redness and depth rather than cyanogen by the subtractive-color-mixture method to express light blue marine blue etc. in the field where concentration is thin becomes indispensable especially. Furthermore, although the disperse dye with a blue hue was used by this invention as this blue coloring matter, the coloring matter to apply cannot only be chosen from a hue, needed to be taken into consideration also from viewpoints, such as a dyeing property and a regurgitation property, and was limited extremely.

[0039] When color mixture of this invention persons is carried out and they made these ink dye on the textile which produced and mentioned above the ink containing various kinds of disperse dyes, compared with the usual textile-printing approach, with the combination of the color to be used, the concentration after dyeing, and a color tone and the repeatability when arriving first on the same dyeing conditions repeatedly further are very bad, and the conventional ink jet textile-printing approach discovered things. This phenomenon was especially remarkable when the dyeing processing by the elevated-temperature steaming method (the HT steaming method) or the thermosol process was adopted.

[0040] When it is going to dye two kinds of disperse dyes by one bath by "dyeing" dyeing of polyester etc., also in the conventional textile-printing approach with the affinity of two kinds of the color [It is known that dyeing concentration may differ rarely and it is said that this phenomenon originates in what kind of configuration two kinds of that color has taken underwater (has it combined whether independence is each-other achieved?) ("description color chemistry" color dyeing company). However, this is a problem peculiar to "dyeing" dyeing, and it did not argue about most of this problem by the conventional textile-printing approach.

[0041] However, the difference by the combination of a color is remarkable in the ink jet textile-printing approach beyond "dyeing" dyeing. although this reason is not certain, in the approach of carrying out the sequential arrival drop of the ink globule to a textile like the ink jet textile-printing approach, that there is little absolute magnitude of the color given, by being a dot expression, etc., the difference by the combination of a color is markedly alike, and it thinks to be clearly discovered from the conventional textile-printing approach.

[0042] it found out the color-reproduction range which neither the concentration after dyeing nor a color tone changes with the combination of specific coloring matter by use the coloring matter which this invention persons examine wholeheartedly in view of the above-mentioned problem, and is indicate below, and which was restricted dramatically, but is dramatically stabilize by the color repeatability after dyeing, and lasts to a blue system from a violet system further be markedly alike, and become large.

[0043] That is, the coloring matter used for this invention is restricted to the following.

[0044] It is at least one sort chosen from the group which consists of C.I. De Dis parsing violet 26-28-40-43-48-57-63-77-87-97 as coloring matter in violet ink, and at least one sort chosen from the county which consists of C.I. De Dis parsing violet 26-43-77-97 especially is more desirable coloring matter.

[0045] As coloring matter in blue ink C. I. De Dis parsing blue 56, 73, and 79: It is at least one sort chosen from the group which consists of 1-113-128-148-154-158-165-165:1-165:2-183-197-201-214-224-225-257-266-267-287-358-368. At least one sort chosen from the group which consists of C.I. De Dis parsing blue 56-73-79:1-128-154-165-183-201-214-224-257-

266-267-287-368 especially is more desirable.

[0046] At least one or more sorts of these coloring matter are contained in the violet ink and blue ink of this invention, respectively. A content is 1 – 10% of the weight of the range more preferably 0.5 to 15% of the weight 0.1 to 20% of the weight in total to all ink weight.

[0047] The ink in this invention consists of the coloring matter mentioned above, a compound which distributes this coloring matter, and an aqueous solvent object at least.

[0048] As a compound which distributes said coloring matter, the so-called dispersant, a surfactant, pitch powder, etc. can be used.

[0049] As the above-mentioned dispersant or a surfactant, although both an anion system and the Nonion system can be used, as a thing of an anion system, a fatty-acid salt, an alkyl-sulfuric-acid ester salt, alkylbenzene sulfonates, alkyl naphthalenesulfonate, dialkyl sulfo succinate, alkyl phosphate, a naphthalene sulfonic-acid formalin condensate, polyoxyethylene alkyl-sulfuric-acid ester salts, these permutation derivatives, etc. are mentioned. As a thing of the Nonion system, polyoxyethylene alkyl ether, polyoxyethylene alkyl phenyl ether, polyoxyethylene fatty acid ester, a sorbitan fatty acid ester, polyoxyethylene sorbitan fatty acid ester, polyoxyethylene alkylamine, a glycerine fatty acid ester, oxyethylene oxypropylene block polymer, these permutation derivatives, etc. are mentioned.

[0050] As the above-mentioned pitch powder, styrene and its derivative, vinyl naphthalene, and its derivative, alpha, the fatty alcohol ester of beta-ethylene nature unsaturated carboxylic acid, An acrylic acid and its derivative, a maleic acid and its derivative, an itaconic acid, and its derivative, Boletic acid and its derivative, vinyl acetate, vinyl alcohol, vinyl pyrrolidone, These salts etc. can be mentioned to the block copolymer which consists of at least two or more monomers (among these, at least one hydrophilic monomer) chosen from acrylamides, these derivatives, etc., a random copolymer and a graft copolymer, and a list. As for these resin, it is desirable that it is alkali meltable mold resin meltable in the water solution in which the base was dissolved.

[0051] As for the ink in this invention, it is desirable to contain an aqueous solvent object and to contain more preferably the water which is the indispensable component in 30 – 82% of the weight of the range 25 to 87% of the weight ten to 93% of the weight to all ink weight.

[0052] Furthermore, effectiveness of this invention can also be made more remarkable by using a water-soluble organic solvent as an aqueous solvent object. As such a solvent, for example Monohydric alcohol, such as methanol ethanol isopropyl alcohol Ketones or keto alcohol, such as acetone diacetone alcohol, Ether, such as tetrahydrofuran dioxane, Oxyethylene or oxypropylene addition polymers, such as a diethylene-glycol triethylene glycol tetraethylene glycol dipropylene glycol tripropylene glycol polyethylene-glycol polypropylene glycol, The alkylene glycol in which alkylene groups, such as ethylene glycol propylene glycol trimethyl glycol butylene-glycol hexylene glycol, contain 2-6 carbon atoms Triol, such as 1, 2, and 6-hexa triol, thiodiglycol, A bis-hydroxyethyl sulfone, a glycerol, The low-grade alkyl ether of polyhydric alcohol, such as the ethylene glycol monomethyl (or ethyl) ether diethylene-glycol monomethyl (or ethyl) ether triethylene glycol monomethyl (or ethyl) ether The low-grade dialkyl ether of polyhydric alcohol, such as the triethylene glycol dimethyl (or ethyl) ether tetraethylene glycol dimethyl (or ethyl) ether, A sulfolane, a N-methyl-2-pyrrolidone, 2-pyrrolidone, 1,3-dimethyl-2-imidazolidinone, etc. are mentioned. Generally the content of the water-soluble above-mentioned organic solvent is 2 – 45% of the weight of the range preferably one to 50% of the weight to the total weight of ink.

[0053] Although it can be used also as mixture even if independent when using together the aqueous solvent object like the above, the presentation of the most desirable aqueous solvent object contains at least one sort of monovalence or polyhydric alcohol, and its derivative as the above-mentioned solvent. Thiodiglycol, a bis-hydronalium KICHIECHIRU sulfone, a diethylene glycol, triethylene glycol, the triethylene glycol monomethyl ether, tetraethylene glycol wood ether, and ethanol are especially good especially.

[0054] Although the major component of the ink used for this invention is as above-mentioned, various kinds of viscosity controlling agents, a surface tension regulator, a fluorescent brightener, and a defoaming agent can be added if needed. For example, they are surface-tension regulators, such as viscosity controlling agents, such as polyvinyl alcohol celluloses and water



soluble resin, and diethanolamine triethanolamine, pH regulator by the buffer solution, an antifungal agent, etc. Moreover, since a color is distributed, various kinds of surfactants etc. can be added for the object of an except if needed as a component of ink.

[0055] The ink in this invention can be conventionally manufactured by the well-known distributed approach, a mixed approach, etc. using the above-mentioned coloring matter, the compound which distributes this coloring matter, water, a solvent, and other additives.

[0056] The ink jet textile-printing approach of this invention is made to \*\*\*\* the globule of the above-mentioned ink by the ink jet method to said textile, and forms the color mixture section in the ink of at least two or more colors.

[0057] in this case, the sum total of the coating weight of each coloring matter of the color mixture section — 0.01 – 1 mg/cm<sup>2</sup> — adaptation — it is — desirable — 0.015 – 0.6 mg/cm<sup>2</sup> – it is the range of 0.02 – 0.4 mg/cm<sup>2</sup> more preferably. This value can be calculated by surveying coloring matter concentration in the discharge quantity of ink, and ink. Since coloring [ high concentration coating weight / of coloring matter / less than / 0.01mg //cm / two ] is difficult, the effectiveness of this invention does not become clear. Moreover, when exceeding 1 mg/cm<sup>2</sup>, the remarkable effectiveness of improvement, such as concentration, color reproduction range, and coloring stability, is not accepted.

[0058] Although which a well-known ink jet recording method is sufficient as the ink jet method used for ink jet textile printing of this invention, its method which it is [ method ] approach indicated by JP,54-59936,A, and carrier beam ink produces [ method ] a rapid volume change for an operation of heat energy, and makes ink breathe out from nozzle opening according to the applied force by this change of state for example, i.e., Bubble Jet, is conventionally the most effective.

[0059] When using the recording head which has two or more nozzles in the above-mentioned ink jet method, the variation in the regurgitation rate of the ink of each nozzle is small, the regurgitation rate of ink is collected by the range of 5 – 20 m/sec, and this is considered because the condition of osmosis over the fiber of the drop at the time of \*\*\*\* becomes the optimal when the ink which contains a disperse dye at this rate collides with a textile.

[0060] In this invention, even if the above-mentioned ink jet method performs long duration per-continuum textile printing, neither the deposition of the foreign matter to the heater top nor an open circuit of a heater occurs, but stable textile printing of it is attained.

[0061] As conditions which acquire high effectiveness especially, 35–60 degrees C has [ a discharged liquid drop / 20 – 200pl and the amount of ink placing ] four to 40 nl/mm<sup>2</sup> and 1.5kHz or more of drive frequencies, and head temperature desirable [ furthermore, ] in the above-mentioned ink jet method.

[0062] Since the ink given on the aforementioned textile as mentioned above has only adhered in this condition, it is necessary to remove succeedingly the coloring matter which is not dyed [ dyeing of the coloring matter to fiber, and ]. Clearance of the coloring matter which is not dyed [ such dyeing and ] can be conventionally performed by the well-known approach.

[0063] As the approach of the above-mentioned dyeing, it is desirable to use elevated-temperature vacuum deposition (the HT steaming method) or a thermosol process. In the case of the HT steaming method, the processing conditions for 2 – 30 minutes are desirable at 140 degrees C – 190 degrees C, and it is more desirable at 160 degrees C – 180 degrees C. [ of the processing conditions for 6 – 8 minutes ] In the case of a thermosol process, the processing conditions for 10 seconds – 5 minutes are desirable at 160 degrees C – 210 degrees C, and it is more desirable at 180 degrees C – 210 degrees C. [ of the processing conditions for 20 seconds – 2 minutes ]

[0064] The textile-printing object obtained as mentioned above is separated by desired magnitude if needed, processing for obtaining final workpieces, such as attaching by sewing, adhesion, and joining, is performed, and this separated piece can obtain workpieces, such as a necktie and a handkerchief.

[0065] Next, the equipment used for the ink jet textile-printing approach of this invention is explained. As suitable equipment, the heat energy corresponding to a record signal is given to the indoor ink of a recording head, and the equipment made to generate a drop with this heat

energy is mentioned. The example of a configuration of the recording head which is the body of such equipment is shown in drawing 1 , drawing 2 , and drawing 3 . Drawing 1 is [ the A-A line sectional view of drawing 1 of a recording head and drawing 3 of the appearance perspective view of a recording head and drawing 2 ] the B-B line sectional views of drawing 2 of a recording head.

[0066] A recording head pastes up the exoergic head (3) used for dry heat record with Itabe (2) (it consists of glass, ceramics, plastics, etc.) who has the orifice (1) which is the delivery of ink and has the slot (4) which lets ink pass, and is obtained. The exoergic head (3) consists of a good substrate (9) of heat dissipation nature, such as an exoergic resistor layer (7) formed with the protective coat (5) formed with silicon oxide etc., an aluminum electrode (6a, 6b), Nichrome, etc., an accumulation layer (8), and an alumina.

[0067] Ink is coming to the orifice (1) and forms the meniscus with the pressure P. If an electrical signal joins an aluminum electrode (6a, 6b), the field shown by n of an exoergic head (3) will generate heat rapidly, and air bubbles will be generated in the ink which has touched here. A projection and ink are breathed out for a meniscus by the pressure of these air bubbles from an orifice (1). From an orifice (1), the ink which carried out the regurgitation forms a record globule, and flies toward a textile.

[0068] An example of the ink jet textile-printing equipment which included the above-mentioned recording head in drawing 4 is shown. In drawing 4 , 401 is a blade as a wiping member, and the end is held by the blade attachment component, turns into the fixed end, and makes the gestalt of a cantilever. A blade (401) is held with the gestalt which was arranged in the location contiguous to the record section by the recording head, and projected in the moving trucking of a recording head in this example. 402 is a cap, it is arranged in the home position which adjoins a blade (401), moves in the direction vertical to the migration direction of a recording head, contacts a delivery side, and is equipped with the configuration which performs capping. Further 403 is an absorber for recovery which adjoins a blade (401) and is formed, and is held like a blade (401) with the gestalt which projected in the moving trucking of a recording head. The regurgitation recovery section (404) is constituted by the above-mentioned blade (401), a cap (402), and the absorber (403) for recovery, and clearance of the moisture of an ink delivery side, dust, etc. is performed by a blade (401) and the absorber (403) for recovery.

[0069] 405 is a recording head, this recording head (405) has a regurgitation energy generation means, and the delivery side which allotted the delivery is arranged in the location which counters a textile. 406 is the carriage for carrying a recording head (405) and moving this recording head. Carriage (406) engaged with the guide shaft (407) possible [ sliding ], and has connected a part of carriage (406) with the belt (409) driven by the motor (408) (un-illustrating). Thereby, carriage (406) becomes movable [ in alignment with a guide shaft (407) ], and becomes movable [ the record section by the recording head (405), and its adjoining field ].

[0070] The cloth feeding section for 410 to insert a textile and 411 are cloth delivery rollers driven by the non-illustrated motor. It \*\*\*\* to \*\*\*\*\* (un-illustrating) which arranged the \*\*\*\* roller (412) as a textile is granted in the delivery side of a recording head (405), and the location which counters and record advances by these configurations.

[0071] In the above-mentioned configuration, in case a recording head (405) returns to a home position by record termination etc., although the cap (402) of the regurgitation recovery section (404) is evacuated from the moving trucking of a recording head (405), the blade (401) projects in moving trucking. Consequently, wiping of the delivery side of a recording head (405) is carried out. In addition, when a cap (402) performs capping in contact with the regurgitation side of a recording head (405), a cap (402) moves so that it may project in the moving trucking of a recording head.

[0072] When a recording head (405) moves to a recording start location from a home position, a cap (402) and a blade (401) are in the same location as the location at the time of wiping mentioned above. Consequently, also in this migration, wiping of the delivery side of a recording head (405) is carried out.

[0073] Not only the time of record termination and regurgitation recovery but while moving in a record section for record of a recording head, migration at the home position of an above-

mentioned recording head adjoined the record section at the predetermined spacing, and carries out home-position migration, and the above-mentioned wiping is performed with this migration.

[0074] The sectional view of an ink cartridge is shown in drawing 5 . An ink cartridge supplies ink to a recording head through ink feed zone material (for example, tube etc.). 501 is the ink hold sections (for example, ink bag etc.) which held the ink for supply, and the plug (502) made of rubber is formed at the head here. By inserting a needle (un-illustrating) in this plug (502), the ink in the ink hold section (501) enables supply to a recording head. 503 is a waste ink absorber which receives waste ink. As the ink hold section (501), that in which ink and a liquid-facing surface are formed with polyolefine, especially polyethylene is desirable for this invention.

[0075] As ink jet textile-printing equipment of this invention, not only that from which the recording head and ink cartridge like the above became another object but the thing (henceforth a "record unit") of one apparatus as shown in drawing 6 is used suitably.

[0076] In drawing 6 , the ink hold sections (for example, ink absorber etc.) which held the ink for supply into the record unit are contained, and the ink in this ink hold section has composition breathed out as an ink droplet from the recording head (601) which has two or more orifices. As an ingredient of an ink absorber, it is desirable for this invention to use polyurethane. 602 is atmospheric-air free passage opening for making atmospheric air open the interior of a record unit for free passage. This record unit is replaced with and used for the recording head (405) shown in drawing 4 , and the desorption of it has become free to carriage (406).

[0077] Although the ink jet textile-printing approach, the equipment, and the ink set of this invention are applicable also to office use, it is suitable for industrial youths other than office use especially.

[0078]

[Example] Hereafter, although an example explains this invention further, this invention is not limited to these. In addition, as long as there is no notice especially, there are weight criteria among a sentence with the "section" and "%."

[0079] Example 1 disperse-dye liquid (I) and production of (II): After having mixed the polyoxyethylene ARUKIRI ethereal sulfate sodium 5 section, the ion-exchange-water 75 section, and the diethylene-glycol 5 section, adding the disperse dye 15 following section to this solution and performing pre mixing for 30 minutes, distributed processing was performed on condition that the following. Disperse dye: C.I. De Dis parsing violet 26 (for color dispersion liquid (I)), C.I. De Dis parsing blue 183 (for color dispersion liquid (II)), disperser: Sand grinder (product made from Igarashi machine), diameter [ of grinding media: zirconium bead 1mm ], grinding media [ filling factor: 50% of ] (volume), and grinding time amount: 3 hours.

[0080] Subsequently, after performing centrifugal separation processing (for 12000rpm and 20 minutes), it filtered in FURORO pore filter FP-250 (Sumitomo Electric Industries make), the big and rough particle was removed, and disperse dye liquid (I) and (II) were obtained, respectively.

[0081] Ink (A) and production of (B): The following component was mixed, the acetic acid adjusted this mixed liquor to pH 5-7, and ink (A) and (B) were obtained, respectively. The above-mentioned disperse dye liquid (I) or the (II): 40 section, the bis-hydroxyethyl sulfone: 24 section, the diethylene-glycol: 11 section, the ion-exchange-water: 25 section.

[0082] Before giving ink on a textile, the textile which consists of polyester 100% textile fabrics was beforehand dipped in processing liquid (10% of ureas, 2% of sodium alginates, 88% of water), and it dried after dehydration at 30% of contraction percentages.

[0083] On this textile, ink (A) and (B) were printed with the color bubble-jet printer BJC (a trade name, Canon make), respectively, and a total of 24 kinds were produced for the following printing patches in the magnitude of 2x4cm.

[0084] Monochrome printing patch: What printed ink (A) and (B) by each amounts 2, 4, and 6 of ink placing, and 8nl/mm<sup>2</sup>, respectively.

[0085] Color-mixture printing patch: 16 kinds of things which printed ink (A) and (B) in piles in all the combination of the above-mentioned amount of placing (for example, patch which printed the patch and ink (A) which printed ink (A) and ink (B) both by 2 2 nl(s)/mm by 2, and printed ink (B) by 2 2 nl(s)/mm 4 nl(s)/mm).

[0086] Thus, dyeing according the printed textile to steaming processing (the HT steaming

method) was performed for 6 – 8 minutes at 160 degrees C, respectively. Subsequently, neutral detergent washed these textiles and the textile-printing object of this invention was obtained. [0087] The below-mentioned assessment approach estimated the color enhancement of the field of a violet system to the blue system of a textile-printing object, and coloring stability. A result is shown in a table 1. As shown in a table 1, the color enhancement of the field of a violet system to a blue system was good, and, moreover, the coloring stability in the color mixture section also had it. [ good ]

[0088] Example 2 disperse-dye liquid (III) and production of (IV): After having mixed the ligninsulfonic acid sodium 2 section, the ion-exchange-water 73 section, and the diethylene-glycol 15 section, adding the disperse dye 10 following section to this solution and performing pre mixing for 30 minutes, distributed processing was performed on condition that the following. Disperse dye: C.I. De Dis parsing violet 77 (for color dispersion liquid (III)), C.I. De Dis parsing blue 165 (for color dispersion liquid (IV)), disperser: Sand grinder (product made from Igarashi machine), diameter [ of grinding media: glass bead 0.5mm ], grinding media [ filling factor: 70% of ] (volume), and grinding time amount: 3 hours.

[0089] Subsequently, after performing centrifugal separation processing (for 12000rpm and 20 minutes), it filtered in FURORO pore filter FP-250 (Sumitomo Electric Industries make), the big and rough particle was removed, and disperse dye liquid (III) and (IV) were obtained, respectively.

[0090] Production of ink (C) and (D): The following component was mixed, the acetic acid adjusted this mixed liquor to pH 5–7, and ink (C) and (D) were obtained, respectively. The above-mentioned disperse dye liquid (III) or the (IV):30 section, the thiodiglycol:5 section, the diethylene-glycol:10 section, the tetraethylene glycol wood ether:5 section, the ion-exchange-water:50 section.

[0091] On the same textile as an example 1, the same pattern was printed for ink (C) and (D) by the respectively same approach as an example 1. Subsequently, dyeing by the thermostat sol processing for 40 – 50 seconds was performed at 200 degrees C. Then, neutral detergent washed these textiles and the textile-printing object of this invention was obtained.

[0092] The below-mentioned assessment approach estimated the color enhancement of the field of a violet system to the blue system of a textile-printing object, and coloring stability. A result is shown in a table 1. As shown in a table 1, the color enhancement of the field of a violet system to a blue system was good, and, moreover, the coloring stability in the color mixture section also had it. [ good ]

[0093] Production of example 3 disperse-dye liquid (V) and (VI): After having mixed the beta naphthalene sulfonic-acid formaldehyde condensate 20 section, the ion-exchange-water 50 section, and the diethylene-glycol 10 section, adding the disperse dye 20 following section to this solution and performing pre mixing for 30 minutes, distributed processing was performed on condition that the following. Disperse dye: The C.I. De Dis parsing violet 97 (for color dispersion liquid (V)), the C.I. De Dis parsing blue 79:1 (for color dispersion liquid (VI)), a disperser: pearl mill (Ashizawa make), the diameter of grinding media: glass bead 1mm, filling factor: 50% of grinding media (volume), and regurgitation rate: 10 ml/min.

[0094] Subsequently, after performing centrifugal separation processing (for 12000rpm and 20 minutes), it filtered in FURORO pore filter FP-250 (Sumitomo Electric Industries make), the big and rough particle was removed, and disperse dye liquid (V) and (VI) were obtained, respectively.

[0095] Ink (E) and production of (F): The following component was mixed, the acetic acid adjusted this mixed liquor to pH 5–7, and ink (E) and (F) were obtained, respectively. The above-mentioned disperse dye liquid (V) or the (VI):50 section, the ethylene glycol:5 section, the bis-hydroxyethyl sulfone:18 section, the diethylene-glycol:5 section, the isopropanol plus alcoholic:3 section, the ion-exchange-water:19 section.

[0096] Before giving ink on a textile, the textile which consists of textile fabrics which mixed polyester 70% and 30% of cotton was beforehand dipped in processing liquid (10% [ of ureas ], and carboxymethyl-cellulose 2%, 88% of water), and it dried after dehydration at 30% of contraction percentages.

[0097] On this textile, the same pattern was printed for ink (E) and (F) by the respectively same

approach as an example 1. Subsequently, steaming processing for [ 6 minutes – ] 8 minutes (the HT steaming method) was performed at 160 degrees C. Then, neutral detergent washed this and the textile-printing object of this invention was obtained.

[0098] The below-mentioned assessment approach estimated the color enhancement of the field of a violet system to the blue system of a textile-printing object, and coloring stability. A result is shown in a table 1. As shown in a table 1, the color enhancement of the field of a violet system to a blue system was good, and, moreover, the coloring stability in the color mixture section also had it. [ good ]

[0099] example of comparison 1 disperse-dye liquid (VII) — and (VIII) production: — after having mixed the polyoxyethylene-alkyl-ether sodium-sulfate 5 section, the ion-exchange-water 7 section, and the diethylene-glycol 5 section, adding the disperse dye 15 following section to this solution and performing pre mixing for 30 minutes, distributed processing was performed on condition that the following. Disperse dye: C.I. De Dis parsing red 43 (the filling factor of color dispersion liquid (for VII), the C.I. De Dis parsing blue 81:1 (for color dispersion liquid (VIII)), a disperser: Sand grinder (product made from the Igarashi machine), the diameter of grinding media: zirconium bead 1mm, and grinding media: 50% (volume) and grinding time amount: 3 hours.)

[0100] FURORO pore filter FP-250 [ subsequently, ] (Sumitomo Electric Industries make) after performing centrifugal separation processing (for 12000rpm and 20 minutes) — filtration — carrying out — a big and rough particle — removing — disperse dye liquid (VII) — and (VIII) it obtained, respectively.

[0101] Ink (G) and production of (H): The following component was mixed, the acetic acid adjusted this mixed liquor to pH 5–7, and ink (G) and (H) were obtained, respectively. the above-mentioned disperse dye liquid (VII) or (VIII) : — the 40 sections, the bis-hydroxyethyl sulfone:24 section, the diethylene-glycol:11 section, and the ion-exchange-water:25 section.

[0102] On the same textile as an example 1, the same pattern was printed for ink (G) and (H) by the respectively same approach as an example 1. Subsequently, steaming processing for 6 – 8 minutes (the HT steaming method) was performed at 160 degrees C. Then, neutral detergent washed these textiles and the textile-printing object was obtained.

[0103] The below-mentioned assessment approach estimated the color enhancement of the field of a violet system to the blue system of a textile-printing object, and coloring stability. A result is shown in a table 1. As shown in a table 1, moreover, the coloring stability in the color mixture section of the color enhancement of the field of a violet system to a blue system was also bad well.

[0104] Production of example [ of a comparison ] 2 disperse-dye liquid (IX): After having mixed the polyoxyethylene-alkyl-ether sodium-sulfate 5 section, the ion-exchange-water 75 section, and the diethylene-glycol 5 section, adding the disperse dye 15 following section to this solution and performing pre mixing for 30 minutes, distributed processing was performed on condition that the following. Disperse dye: C.I. De Dis parsing red 188 (for color dispersion liquid (IX)), disperser: Sand grinder (product made from Igarashi machine), diameter [ of grinding media: zirconium bead 1mm ], grinding media [ filling factor: 50% of ] (volume), and grinding time amount: 3 hours.

[0105] Subsequently, after performing centrifugal separation processing (for 12000rpm and 20 minutes), it filtered in FURORO pore filter FP-250 (Sumitomo Electric Industries make), the big and rough particle was removed, and disperse dye liquid (IX) was obtained.

[0106] Production of ink (I): The following component was mixed, the acetic acid adjusted this mixed liquor to pH 5–7, and ink (I) was obtained. Disperse-dye (Liquid IX): The 40 sections, the bis-hydroxyethyl sulfone:24 section, the diethylene-glycol:11 section, the ion-exchange-water:25 section. [ Above-mentioned ]

[0107] The same pattern was printed for the ink (B) used in ink (I) and the example 1 on the same textile as an example 1 by the same approach as an example 1. Subsequently, steaming processing (the HT steaming method) was performed for 6 – 8 minutes at 160 degrees C. Then, neutral detergent washed this and the textile-printing object was obtained.

[0108] The below-mentioned assessment approach estimated the color enhancement of the field of a violet system to the blue system of a textile-printing object, and coloring stability. A result

is shown in a table 1. As shown in a table 1, moreover, the coloring stability in the color mixture section of the color enhancement of the field of a violet system to a blue system was also bad well.

[0109] Production of example [ of a comparison ] 3 disperse-dye liquid (X): After having mixed the beta naphthalene sulfonic-acid formaldehyde condensate 20 section, the ion-exchange-water 50 section, and the diethylene-glycol 10 section, adding the disperse dye 20 following section to this solution and performing pre mixing for 30 minutes, distributed processing was performed on condition that the following. Disperse dye: The C.I. De Dis parsing blue 7 (cyanogen color) (for color dispersion liquid (X)), a disperser:pearl mill (Ashizawa make), the diameter of grinding media:glass bead 1mm, filling factor:50% of grinding media (volume), and regurgitation rate:100 ml/min.

[0110] Subsequently, after performing centrifugal separation processing (for 12000rpm and 20 minutes), it filtered in FURORO pore filter FP-250 (Sumitomo Electric Industries make), the big and rough particle was removed, and disperse dye liquid (X) was obtained.

[0111] Production of ink (J): The following component was mixed, the acetic acid adjusted this mixed liquor to pH 5-7, and ink (J) was obtained. Disperse-dye (Liquid X): The 50 sections, the ethylene glycol:5 section, the bis-hydroxyethyl sulfone:18 section, the diethylene-glycol:5 section, the isopropanol pilus alcoholic :3 section, the ion-exchange-water:19 section. [ Above-mentioned ]

[0112] The same pattern was printed for the ink (E) used in ink (J) and the example 3 on the same textile as an example 3 by the same approach as an example 1. Subsequently, dyeing by the steaming processing for 6 - 8 minutes (the HT steaming method) was performed at 160 degrees C. Then, neutral detergent washed this and the textile-printing object was obtained.

[0113] The following assessment approach estimated the color enhancement of the field of a violet system to the blue system of a textile-printing object, and coloring stability. A result is shown in a table 1. As shown in a table 1, moreover, the coloring stability in the color mixture section of the color enhancement of the field of a violet system to a blue system was also bad well.

[0114] Color enhancement of the field of a violet system to the blue system of the assessment approach textile-printing object: The obtained printing patch was checked with the color chip of Munsell, and that according to which a color is classified into purple and purple blue was chosen. subsequently, each chromaticity  $a^*$  and  $b^*$  of the selected printing patch — the Minolta make — a spectrum — saturation  $C^*$  was computed by having measured by colorimeter CM-2022, and saturation  $C^*$  evaluated by the number of 55 or more things (ten or more: O, 5-9:\*\*, less than [ 5 ];x). In addition, saturation  $C^*$  is excellent in saturation, so that the numeric value is large, and it can be said for the range of a color expression to be wide. Calculation of saturation  $C^*$  is called for from  $C^*=(a^*)^2+(b^*)^2)^{1/2}$ . Moreover, the color chip of Munsell is an approach for judging the color of an object with a color sample, and the hue is classified into ten kinds, such as blue purple purple blue. In this classification, the color of the field of a violet system to a blue system is contained in purple and purple blue.

[0115] Coloring stability: The K/S value change obtained by the degree type estimated.  $K/S \text{ value} = (1-R)^2/2R$  and R are the reflection factor of the maximum absorption wavelength. K/S value was measured, respectively about what should steaming-processing-carry out steaming processing for 8 minutes for 6 minutes at 160 degrees C about examples 1 and 3 and the examples 1-3 of a comparison, and those differences were seen. K/S value was measured, respectively about what carried out thermostat sol processing for 40 seconds at 200 degrees C about the example 2, and the thing processed for 50 seconds, and those differences were seen. The difference of K/S value exceeded one (the difference by heating conditions is small) or less, the difference of O, and K/S value exceeded 1, and the difference of \*\*, K / S value made x two (the difference by heating conditions is large) or more less than for two (there are some differences by heating conditions).

[0116]

[A table 1]

表 1

	バィレツ系からブル系の領域の発色性	発色安定性
実施例 1	○	○
実施例 2	○	○
実施例 3	○	○
比較例 1	△	×
比較例 2	△	×
比較例 3	×	△

[0117]

[Effect of the Invention] According to this invention, the textile-printing (color reproduction range is wide) object excellent in the color enhancement of the field of a violet system to a blue system can be obtained so that clearly from the above explanation. And since it excels in coloring stability, even if the dyeing processing conditions by heating change somewhat, a stable image can be obtained, and it can print with sufficient repeatability.

[Translation done.]

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**TECHNICAL FIELD**

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[Field of the Invention] This invention relates to the ink jet textile-printing approach, textile-printing equipment, the ink set for textile printing, and a textile-printing object.

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**PRIOR ART**

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[Description of the Prior Art] The mainstream of current and textile printing is screen printing and roller printing. However, since these methods are unsuitable for limited production with a wide variety and the prompt action to an epidemic is also difficult, recently, establishment of a non-engraved electronic textile-printing system is demanded.

[0003] To this want, many textile-printing approaches by the ink jet method are proposed, and the expectation from every direction is also large.

[0004] giving sufficient concentration for (1) coloring as a technical problem of the conventional ink jet textile-printing approach, that the percentage exhaustion to the textile of (2) coloring matter is high, and the waste water treatment after a washing process is easy, that the irregular blot by the color mixture between unique is not conspicuous on (3) textiles, that the range of (4) color reproduction is wide, and (5) — it is mentioned that the always stabilized production is possible etc.

[0005] In order to satisfy these technical problems, in the former, add various additives mainly to ink, the amount of placing of ink is operated, or it has corresponded [ processing beforehand to a textile, etc. and ].

[0006] Moreover, the approach sublimation temperature uses a disperse dye 180 degrees C or more is indicated as the ink jet textile-printing approach for the textile which prints using a disperse dye, for example, a polyester textile, (JP,61-118477,A).

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**EFFECT OF THE INVENTION**

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[Effect of the Invention] According to this invention, the textile-printing (color reproduction range is wide) object excellent in the color enhancement of the field of a violet system to a blue system can be obtained so that clearly from the above explanation. And since it excels in coloring stability, even if the dyeing processing conditions by heating change somewhat, a stable image can be obtained, and it can print with sufficient repeatability.

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**TECHNICAL PROBLEM**

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[Problem(s) to be Solved by the Invention] However, although good coloring is shown when ink using the disperse dye which paid its attention only to sublimation temperature as coloring matter prints, and each ink is made to dye independently When color mixture of the ink is carried out on a textile, with the combination of the color to be used In order for the repeatability when dyeing repeatedly on the concentration after dyeing, a color tone, and the same dyeing conditions to get very bad, to stop filling simultaneously above-mentioned technical-problem (1) - (4) - (5) etc. in many cases and to perform various color expressions, the approach of starting was inadequate.

[0008] Therefore, it was impossible various kinds of demand items mentioned above and to especially have filled a technical problem (5) fully only at the Prior art.

[0009] Moreover, in order for how far the size of the color reproduction range of the above-mentioned technical problem (4) can be taken out to spread the ink jet textile-printing approach widely, it is important. Because, in the conventional textile printing, in order to carry out color mixture of the ink on a textile by textile printing by the ink jet method to the color of very many color tones having been freely employable since printing paste was prepared for every color and to obtain the variation of a color, the color of the ink to be used will be restricted to some kinds.

[0010] On the ink jet print to recorded materials, such as the conventional paper, the three primary colors of yellow Magenta cyanogen expressed all the colors with subtractive color mixture in many cases. However, in ink jet textile printing, when printing using the ink which contains a disperse dye to a textile which makes polyester a subject, especially the color repeatability of a violet system to a blue system was not able to express about the same conventional color tone or saturation as textile printing only by the technique by the color mixture of a Magenta and cyanogen.

[0011] Although invention to the above-mentioned technical problem is indicated by JP, 7-26476, A, it is more rich and amplification (it is hard to express to a numeric value) of the color repeatability of a violet system to a deep blue system is demanded further.

[0012] Then, the thing for which an above-mentioned problem is solved in case the object of this invention carries out ink jet textile printing of the fiber which can be dyed by the disperse dye at the textile constituted as a subject, even if the color reproduction range especially applied to a blue system from a violet system can be markedly alike as compared with the conventional technique, it can obtain a large textile-printing object and the dyeing processing conditions by heating change somewhat further, it is offering the ink jet textile-printing approach with sufficient repeatability a stable image's being obtained. Moreover, it is offering the ink jet textile-printing equipment used for this approach, the ink set for textile printing, and a textile-printing object.

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## MEANS

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[Means for Solving the Problem] this invention persons completed this invention, as a result of repeating various examination, in order to attain the above-mentioned object.

[0014] The 1st invention at least the ink of violet and two blue colors It is the approach of printing by an ink jet method giving on a textile. (a) The process which gives the ink of said two colors on a textile so that at least a part may lap, (b) The process which heat-treats the textile to which said ink was given, the process which washes the textile which carried out the (c) aforementioned heat treatment, Have \*\* 3 process at least and said textile contains the fiber which can be dyed by the disperse dye. Said each of ink contains at least coloring matter, the compound with which this coloring matter is distributed, and an aqueous solvent object. A kind of coloring matter chosen from the group which said violet ink becomes from the C.I. De Dis parsing violet 26-28-40-43-48-57-63-77-87-97 is contained at least. Said blue ink C. I. De Dis parsing blue 56, 73, and 79: At least a kind of coloring matter chosen from the group which consists of 1-113-128-148-154-158-165-165:1-165:2-183-197-201-214-224-225-257-266-267-287-358-368 It is related with the ink jet textile-printing approach characterized by containing.

[0015] The 2nd invention relates to the ink jet textile-printing approach of the 1st invention that a textile contains polyester fiber as fiber which can be dyed by the disperse dye.

[0016] The 3rd invention relates to the 1st whose heat treatment of a process (b) is an elevated-temperature steaming method (the HT steaming method) or a thermosol process, or the ink jet textile-printing approach of the 2nd invention.

[0017] The 4th invention relates to the 1st whose an ink jet method is an ink jet method which makes ink breathe out using heat energy, the 2nd, or the ink jet textile-printing approach of the 3rd invention.

[0018] The 5th invention relates to the ink jet textile-printing approach of the 1st - one of invention of the 4th that the regurgitation rate of ink is 5 - 20 m/sec.

[0019] The 6th invention relates to the ink jet textile-printing approach of the 1st which pretreats a textile before a process (a) - one of invention of the 5th.

[0020] The 7th invention relates to the ink set for textile printing which is used for the approach of the 1st - one of invention of the 6th and which contains violet ink and blue ink at least.

[0021] The 8th invention relates to the textile-printing object printed by the approach of the 1st - one of invention of the 6th.

[0022] The 9th invention is a textile-printing object with which the coloring matter of violet and two blue colors is printed in the condition of having overlapped in part at least. As being chosen out of the group which said violet coloring matter becomes from the C.I. De Dis parsing violet 26-28-40-43-48-57-63-77-87-97, a kind is contained as it is few. Said blue coloring matter C.I. De Dis parsing blue 56, 73, and 79: As being chosen out of the group which consists of 1-113-128-148-154-158-165-165:1-165:2-183-197-201-214-224-225-257-266-267-287-358-368, a kind is contained as it is few. And said textile-printing object It is related with the textile-printing object characterized by being printed by the textile containing the fiber which can be dyed by the disperse dye.

[0023] The 10th invention is the textile-printing object of the 9th invention which is that in which a textile contains polyester fiber as fiber which can be dyed by the disperse dye.

[0024] The 11th invention relates to the workpiece which processed the 8th, the 9th, or the textile-printing object of the 10th invention, and was obtained.

[0025] The 12th invention relates to the record unit used for the approach of the 1st [ equipped with the ink hold section which held ink, and the recording head for making ink breathe out as an ink droplet ] – one of invention of the 6th.

[0026] The 13th invention relates to the record unit of the 12th invention whose recording head is a recording head which makes heat energy act on ink and makes an ink droplet breathe out.

[0027] The 14th invention relates to the ink cartridge used for the approach of the 1st [ equipped with the ink hold section which held ink ] – one of invention of the 6th.

[0028] The 15th invention relates to the ink jet textile-printing equipment used for the approach of the 1st which equipped said recording head with the ink feed zone for supplying ink – one of invention of the 6th from the recording head for carrying out the regurgitation of the ink, the ink cartridge which has the ink hold section which held ink, and this ink cartridge.

[0029] The 16th invention relates to the ink jet textile-printing equipment of the 15th invention whose recording head is a recording head which makes heat energy act on ink and makes an ink droplet breathe out.

[0030]

[Embodiment of the Invention] Hereafter, this invention is explained to a detail.

[0031] The textile used in this invention contains the fiber which can be dyed by the disperse dye. As fiber which can be dyed by the disperse dye, what consists of polyester, acetate, triacetate, etc. is desirable. What consists of polyester especially is desirable. These fiber can use textiles, knitting, a nonwoven fabric, etc. with any gestalt.

[0032] Although the thing of 100% of fiber which can be dyed by the disperse dye is suitable for the textile used for this invention, if it is 50% or more preferably, mixed textile fabrics or a mixed nonwoven fabric with the textile which consists of fiber which can be dyed by the disperse dye, and other raw materials, for example, rayon, cotton, polyurethane, an acrylic, NAION, wool, silk, etc. can be used as a textile for textile printing of this invention 30% or more of blending ratios.

[0033] Although that whose blending ratio of the fiber which can be dyed by the disperse dye is 100% is suitable for the textile used for the approach of this invention, if a blending ratio is 50% or more preferably, it can use mixed textile fabrics or a mixed nonwoven fabric of the fiber which can be dyed by the disperse dye, and other raw materials etc. 30% or more. As other raw materials, rayon, cotton, polyurethane, an acrylic, nylon, wool, silk, etc. are mentioned, for example.

[0034] The textile used by the approach of this invention may perform well-known pretreatment conventionally if needed. using the processing liquid (for example, water solution) which contained the urea, the water soluble polymer, the water-soluble metal salt, etc. 0.01 to 20% of the weight especially — it is desirable. A textile is dipped in this processing liquid and dried after dehydration.

[0035] As an example of the above-mentioned water soluble polymer, well-known natural water solubility macromolecules, such as protein matter, such as polysaccharide, such as cellulose type matter, such as starch matter, such as corn and wheat, and carboxymethyl-cellulose methyl cellulose hydroxyethyl cellulose, and a sodium alginate gum Arabic locust-bean-gum tolan TOGAMU guar gum tamarind seed, and gelatin casein, and tannin system matter, lignin system matter, are mentioned. Moreover, as an example of synthetic macromolecule, a well-known polyvinyl alcohol system compound, a polyethylene oxide system compound, an acrylic-acid system water soluble polymer, a maleic-anhydride system water soluble polymer, etc. are mentioned, for example. A polysaccharide system macromolecule and a cellulose type macromolecule are desirable also in these.

[0036] As the water-soluble above-mentioned metal salt, for example like the halogenide of alkali metal or alkaline earth metal, typical ionic crystal is formed and the compound which can be adjusted to pH 4–10 is mentioned. as the typical example of such a compound — alkali metal — NaCl and Na<sub>2</sub> — SO<sub>4</sub>, KCl, CH<sub>3</sub>COONa, etc. are mentioned and CaCl<sub>2</sub> and MgCl<sub>2</sub> grade are mentioned as an alkaline earth metal. Especially, the salts of Na, K, and calcium are desirable.

[0037] Next, the violet and the blue coloring matter which are contained in the ink used for this

invention are explained. This invention is mainly characterized by this.

[0038] According to the subtractive-color-mixture method expressed with conventional yellow Magenta cyanogen, the hue of a violet system to a blue system can be covered by controlling each of two ink, a Magenta and cyanogen. However, the ink which contains the blue coloring matter which is difficult and has [ the time of expressing violet with high saturation and ] redness and depth rather than cyanogen by the subtractive-color-mixture method to express light blue marine blue etc. in the field where concentration is thin becomes indispensable especially. Furthermore, although the disperse dye with a blue hue was used by this invention as this blue coloring matter, the coloring matter to apply cannot only be chosen from a hue, needed to be taken into consideration also from viewpoints, such as a dyeing property and a regurgitation property, and was limited extremely.

[0039] When color mixture of this invention persons is carried out and they made these ink dye on the textile which produced and mentioned above the ink containing various kinds of disperse dyes, compared with the usual textile-printing approach, with the combination of the color to be used, the concentration after dyeing, and a color tone and the repeatability when arriving first on the same dyeing conditions repeatedly further are very bad, and the conventional ink jet textile-printing approach discovered things. This phenomenon was especially remarkable when the dyeing processing by the elevated-temperature steaming method (the HT steaming method) or the thermosol process was adopted.

[0040] When it is going to dye two kinds of disperse dyes by one bath by "dyeing" dyeing of polyester etc., also in the conventional textile-printing approach with the affinity of two kinds of the color It is known that dyeing concentration may differ rarely and it is said that this phenomenon originates in what kind of configuration two kinds of that color has taken underwater (has it combined whether independence is each-other achieved?) ("description color chemistry" color dyeing company). However, this is a problem peculiar to "dyeing" dyeing, and it did not argue about most of this problem by the conventional textile-printing approach.

[0041] However, the difference by the combination of a color is remarkable in the ink jet textile-printing approach beyond "dyeing" dyeing. although this reason is not certain, in the approach of carrying out the sequential arrival drop of the ink globule to a textile like the ink jet textile-printing approach, that there is little absolute magnitude of the color given, by being a dot expression, etc., the difference by the combination of a color is markedly alike, and it thinks to be clearly discovered from the conventional textile-printing approach.

[0042] it found out the color-reproduction range which neither the concentration after dyeing nor a color tone changes with the combination of specific coloring matter by use the coloring matter which this invention persons examine wholeheartedly in view of the above-mentioned problem, and is indicate below, and which was restricted dramatically, but is dramatically stabilize by the color repeatability after dyeing, and lasts to a blue system from a violet system further be markedly alike, and become large.

[0043] That is, the coloring matter used for this invention is restricted to the following.

[0044] It is at least one sort chosen from the group which consists of C.I. De Dis parsing violet 26-28-40-43-48-57-63-77-87-97 as coloring matter in violet ink, and at least one sort chosen from the county which consists of C.I. De Dis parsing violet 26-43-77-97 especially is more desirable coloring matter.

[0045] As coloring matter in blue ink C. I. De Dis parsing blue 56, 73, and 79: It is at least one sort chosen from the group which consists of 1-113-128-148-154-158-165-165:1-165:2-183-197-201-214-224-225-257-266-267-287-358-368. At least one sort chosen from the group which consists of C.I. De Dis parsing blue 56-73-79:1-128-154-165-183-201-214-224-257-266-267-287-368 especially is more desirable.

[0046] At least one or more sorts of these coloring matter are contained in the violet ink and blue ink of this invention, respectively. A content is 1 - 10% of the weight of the range more preferably 0.5 to 15% of the weight 0.1 to 20% of the weight in total to all ink weight.

[0047] The ink in this invention consists of the coloring matter mentioned above, a compound which distributes this coloring matter, and an aquosity solvent object at least.

[0048] As a compound which distributes said coloring matter, the so-called dispersant, a

surfactant, pitch powder, etc. can be used.

[0049] As the above-mentioned dispersant or a surfactant, although both an anion system and the Nonion system can be used, as a thing of an anion system, a fatty-acid salt, an alkyl-sulfuric-acid ester salt, alkylbenzene sulfonates, alkyl naphthalenesulfonate, dialkyl sulfo succinate, alkyl phosphate, a naphthalene sulfonic-acid formalin condensate, polyoxyethylene alkyl-sulfuric-acid ester salts, these permutation derivatives, etc. are mentioned. As a thing of the Nonion system, polyoxyethylene alkyl ether, polyoxyethylene alkyl phenyl ether, polyoxyethylene fatty acid ester, a sorbitan fatty acid ester, polyoxyethylene sorbitan fatty acid ester, polyoxyethylene alkylamine, a glycerine fatty acid ester, oxyethylene oxypropylene block polymer, these permutation derivatives, etc. are mentioned.

[0050] As the above-mentioned pitch powder, styrene and its derivative, vinyl naphthalene, and its derivative, alpha, the fatty alcohol ester of beta-ethylene nature unsaturated carboxylic acid, An acrylic acid and its derivative, a maleic acid and its derivative, an itaconic acid, and its derivative, Boletic acid and its derivative, vinyl acetate, vinyl alcohol, vinyl pyrrolidone, These salts etc. can be mentioned to the block copolymer which consists of at least two or more monomers (among these, at least one hydrophilic monomer) chosen from acrylamides, these derivatives, etc., a random copolymer and a graft copolymer, and a list. As for these resin, it is desirable that it is alkali meltable mold resin meltable in the water solution in which the base was dissolved.

[0051] As for the ink in this invention, it is desirable to contain an aqueous solvent object and to contain more preferably the water which is the indispensable component in 30 – 82% of the weight of the range 25 to 87% of the weight ten to 93% of the weight to all ink weight.

[0052] Furthermore, effectiveness of this invention can also be made more remarkable by using a water-soluble organic solvent as an aqueous solvent object. As such a solvent, for example Monohydric alcohol, such as methanol ethanol isopropyl alcohol Ketones or keto alcohol, such as acetone diacetone alcohol, Ether, such as tetrahydrofuran dioxane, Oxyethylene or oxypropylene addition polymers, such as a diethylene-glycol triethylene glycol tetraethylene glycol dipropylene glycol tripropylene glycol polyethylene-glycol polypropylene glycol, The alkylene glycol in which alkylene groups, such as ethylene glycol propylene glycol trimethyl glycol butylene-glycol hexylene glycol, contain 2-6 carbon atoms Triol, such as 1, 2, and 6-hexa triol, thiodiglycol, A bis-hydroxyethyl sulfone, a glycerol, The low-grade alkyl ether of polyhydric alcohol, such as the ethylene glycol monomethyl (or ethyl) ether diethylene-glycol monomethyl (or ethyl) ether triethylene glycol monomethyl (or ethyl) ether The low-grade dialkyl ether of polyhydric alcohol, such as the triethylene glycol dimethyl (or ethyl) ether tetraethylene glycol dimethyl (or ethyl) ether, A sulfolane, a N-methyl-2-pyrrolidone, 2-pyrrolidone, 1,3-dimethyl-2-imidazolidinone, etc. are mentioned. Generally the content of the water-soluble above-mentioned organic solvent is 2 – 45% of the weight of the range preferably one to 50% of the weight to the total weight of ink.

[0053] Although it can be used also as mixture even if independent when using together the aqueous solvent object like the above, the presentation of the most desirable aqueous solvent object contains at least one sort of monovalence or polyhydric alcohol, and its derivative as the above-mentioned solvent. Thiodiglycol, a bis-hydronalium KICHIECHIRU sulfone, a diethylene glycol, triethylene glycol, the triethylene glycol monomethyl ether, tetraethylene glycol wood ether, and ethanol are especially good especially.

[0054] Although the major component of the ink used for this invention is as above-mentioned, various kinds of viscosity controlling agents, a surface tension regulator, a fluorescent brightener, and a defoaming agent can be added if needed. For example, they are surface-tension regulators, such as viscosity controlling agents, such as polyvinyl alcohol celluloses and water soluble resin, and diethanolamine triethanolamine, pH regulator by the buffer solution, an antifungal agent, etc. Moreover, since a color is distributed, various kinds of surfactants etc. can be added for the object of an except if needed as a component of ink.

[0055] The ink in this invention can be conventionally manufactured by the well-known distributed approach, a mixed approach, etc. using the above-mentioned coloring matter, the compound which distributes this coloring matter, water, a solvent, and other additives.

[0056] The ink jet textile-printing approach of this invention is made to \*\*\*\* the globule of the

above-mentioned ink by the ink jet method to said textile, and forms the color mixture section in the ink of at least two or more colors.

[0057] in this case, the sum total of the coating weight of each coloring matter of the color mixture section — 0.01 – 1 mg/cm<sup>2</sup> — adaptation — it is — desirable — 0.015 – 0.6 mg/cm<sup>2</sup> – – it is the range of 0.02 – 0.4 mg/cm<sup>2</sup> more preferably. This value can be calculated by surveying coloring matter concentration in the discharge quantity of ink, and ink. Since coloring [ high concentration coating weight / of coloring matter / less than / 0.01mg //cm / two ] is difficult, the effectiveness of this invention does not become clear. Moreover, when exceeding 1 mg/cm<sup>2</sup>, the remarkable effectiveness of improvement, such as concentration, color reproduction range, and coloring stability, is not accepted.

[0058] Although which a well-known ink jet recording method is sufficient as the ink jet method used for ink jet textile printing of this invention, its method which it is [ method ] approach indicated by JP,54-59936,A, and carrier beam ink produces [ method ] a rapid volume change for an operation of heat energy, and makes ink breathe out from nozzle opening according to the applied force by this change of state for example, i.e., Bubble Jet, is conventionally the most effective.

[0059] When using the recording head which has two or more nozzles in the above-mentioned ink jet method, the variation in the regurgitation rate of the ink of each nozzle is small, the regurgitation rate of ink is collected by the range of 5 – 20 m/sec, and this is considered because the condition of osmosis over the fiber of the drop at the time of \*\*\*\* becomes the optimal when the ink which contains a disperse dye at this rate collides with a textile.

[0060] In this invention, even if the above-mentioned ink jet method performs long duration per-continuum textile printing, neither the deposition of the foreign matter to the heater top nor an open circuit of a heater occurs, but stable textile printing of it is attained.

[0061] As conditions which acquire high effectiveness especially, 35–60 degrees C has [ a discharged liquid drop / 20 – 200pl and the amount of ink placing ] four to 40 nl/mm<sup>2</sup> and 1.5kHz or more of drive frequencies, and head temperature desirable [ furthermore, ] in the above-mentioned ink jet method.

[0062] Since the ink given on the aforementioned textile as mentioned above has only adhered in this condition, it is necessary to remove succeedingly the coloring matter which is not dyed [ dyeing of the coloring matter to fiber, and ]. Clearance of the coloring matter which is not dyed [ such dyeing and ] can be conventionally performed by the well-known approach.

[0063] As the approach of the above-mentioned dyeing, it is desirable to use elevated-temperature vacuum deposition (the HT steaming method) or a thermosol process. In the case of the HT steaming method, the processing conditions for 2 – 30 minutes are desirable at 140 degrees C – 190 degrees C, and it is more desirable at 160 degrees C – 180 degrees C. [ of the processing conditions for 6 – 8 minutes ] In the case of a thermosol process, the processing conditions for 10 seconds – 5 minutes are desirable at 160 degrees C – 210 degrees C, and it is more desirable at 180 degrees C – 210 degrees C. [ of the processing conditions for 20 seconds – 2 minutes ]

[0064] The textile-printing object obtained as mentioned above is separated by desired magnitude if needed, processing for obtaining final workpieces, such as attaching by sewing, adhesion, and joining, is performed, and this separated piece can obtain workpieces, such as a necktie and a handkerchief.

[0065] Next, the equipment used for the ink jet textile-printing approach of this invention is explained. As suitable equipment, the heat energy corresponding to a record signal is given to the indoor ink of a recording head, and the equipment made to generate a drop with this heat energy is mentioned. The example of a configuration of the recording head which is the body of such equipment is shown in drawing 1 , drawing 2 , and drawing 3 . Drawing 1 is [ the A-A line sectional view of drawing 1 of a recording head and drawing 3 of the appearance perspective view of a recording head and drawing 2 ] the B-B line sectional views of drawing 2 of a recording head.

[0066] A recording head pastes up the exoergic head (3) used for dry heat record with Itabe (2) (it consists of glass, ceramics, plastics, etc.) who has the orifice (1) which is the delivery of ink



and has the slot (4) which lets ink pass, and is obtained. The exoergic head (3) consists of a good substrate (9) of heat dissipation nature, such as an exoergic resistor layer (7) formed with the protective coat (5) formed with silicon oxide etc., an aluminum electrode (6a, 6b), Nichrome, etc., an accumulation layer (8), and an alumina.

[0067] Ink is coming to the orifice (1) and forms the meniscus with the pressure P. If an electrical signal joins an aluminum electrode (6a, 6b), the field shown by  $n$  of an exoergic head (3) will generate heat rapidly, and air bubbles will be generated in the ink which has touched here. A projection and ink are breathed out for a meniscus by the pressure of these air bubbles from an orifice (1). From an orifice (1), the ink which carried out the regurgitation forms a record globule, and flies toward a textile.

[0068] An example of the ink jet textile-printing equipment which included the above-mentioned recording head in drawing 4 is shown. In drawing 4, 401 is a blade as a wiping member, and the end is held by the blade attachment component, turns into the fixed end, and makes the gestalt of a cantilever. A blade (401) is held with the gestalt which was arranged in the location contiguous to the record section by the recording head, and projected in the moving trucking of a recording head in this example. 402 is a cap, it is arranged in the home position which adjoins a blade (401), moves in the direction vertical to the migration direction of a recording head, contacts a delivery side, and is equipped with the configuration which performs capping. Further 403 is an absorber for recovery which adjoins a blade (401) and is formed, and is held like a blade (401) with the gestalt which projected in the moving trucking of a recording head. The regurgitation recovery section (404) is constituted by the above-mentioned blade (401), a cap (402), and the absorber (403) for recovery, and clearance of the moisture of an ink delivery side, dust, etc. is performed by a blade (401) and the absorber (403) for recovery.

[0069] 405 is a recording head, this recording head (405) has a regurgitation energy generation means, and the delivery side which allotted the delivery is arranged in the location which counters a textile. 406 is the carriage for carrying a recording head (405) and moving this recording head. Carriage (406) engaged with the guide shaft (407) possible [ sliding ], and has connected a part of carriage (406) with the belt (409) driven by the motor (408) (un-illustrating). Thereby, carriage (406) becomes movable [ in alignment with a guide shaft (407) ], and becomes movable [ the record section by the recording head (405), and its adjoining field ].

[0070] The cloth feeding section for 410 to insert a textile and 411 are cloth delivery rollers driven by the non-illustrated motor. It \*\*\*\* to \*\*\*\*\* (un-illustrating) which arranged the \*\*\*\* roller (412) as a textile is granted in the delivery side of a recording head (405), and the location which counters and record advances by these configurations.

[0071] In the above-mentioned configuration, in case a recording head (405) returns to a home position by record termination etc., although the cap (402) of the regurgitation recovery section (404) is evacuated from the moving trucking of a recording head (405), the blade (401) projects in moving trucking. Consequently, wiping of the delivery side of a recording head (405) is carried out. In addition, when a cap (402) performs capping in contact with the regurgitation side of a recording head (405), a cap (402) moves so that it may project in the moving trucking of a recording head.

[0072] When a recording head (405) moves to a recording start location from a home position, a cap (402) and a blade (401) are in the same location as the location at the time of wiping mentioned above. Consequently, also in this migration, wiping of the delivery side of a recording head (405) is carried out.

[0073] Not only the time of record termination and regurgitation recovery but while moving in a record section for record of a recording head, migration at the home position of an above-mentioned recording head adjoined the record section at the predetermined spacing, and carries out home-position migration, and the above-mentioned wiping is performed with this migration.

[0074] The sectional view of an ink cartridge is shown in drawing 5. An ink cartridge supplies ink to a recording head through ink feed zone material (for example, tube etc.). 501 is the ink hold sections (for example, ink bag etc.) which held the ink for supply, and the plug (502) made of rubber is formed at the head here. By inserting a needle (un-illustrating) in this plug (502), the ink in the ink hold section (501) enables supply to a recording head. 503 is a waste ink absorber

which receives waste ink. As the ink hold section (501), that in which ink and a liquid-facing surface are formed with polyolefine, especially polyethylene is desirable for this invention.

[0075] As ink jet textile-printing equipment of this invention, not only that from which the recording head and ink cartridge like the above became another object but the thing (henceforth a "record unit") of one apparatus as shown in drawing 6 is used suitably.

[0076] In drawing 6, the ink hold sections (for example, ink absorber etc.) which held the ink for supply into the record unit are contained, and the ink in this ink hold section has composition breathed out as an ink droplet from the recording head (601) which has two or more orifices. As an ingredient of an ink absorber, it is desirable for this invention to use polyurethane. 602 is atmospheric-air free passage opening for making atmospheric air open the interior of a record unit for free passage. This record unit is replaced with and used for the recording head (405) shown in drawing 4, and the desorption of it has become free to carriage (406).

[0077] Although the ink jet textile-printing approach, the equipment, and the ink set of this invention are applicable also to office use, it is suitable for industrial youths other than office use especially.

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[Translation done.]

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## EXAMPLE

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[Example] Hereafter, although an example explains this invention further, this invention is not limited to these. In addition, as long as there is no notice especially, there are weight criteria among a sentence with the "section" and "%."

[0079] Example 1 disperse-dye liquid (I) and production of (II): After having mixed the polyoxyethylene ARUKIRI ethereal sulfate sodium 5 section, the ion-exchange-water 75 section, and the diethylene-glycol 5 section, adding the disperse dye 15 following section to this solution and performing pre mixing for 30 minutes, distributed processing was performed on condition that the following. Disperse dye: C.I. De Dis parsing violet 26 (for color dispersion liquid (I)), C.I. De Dis parsing blue 183 (for color dispersion liquid (II)), disperser: Sand grinder (product made from Igarashi machine), diameter [ of grinding media: zirconium bead 1mm ], grinding media [ filling factor: 50% of ] (volume), and grinding time amount: 3 hours.

[0080] Subsequently, after performing centrifugal separation processing (for 12000rpm and 20 minutes), it filtered in FURORO pore filter FP-250 (Sumitomo Electric Industries make), the big and rough particle was removed, and disperse dye liquid (I) and (II) were obtained, respectively.

[0081] Ink (A) and production of (B): The following component was mixed, the acetic acid adjusted this mixed liquor to pH 5-7, and ink (A) and (B) were obtained, respectively. The above-mentioned disperse dye liquid (I) or the (II): 40 section, the bis-hydroxyethyl sulfone: 24 section, the diethylene-glycol: 11 section, the ion-exchange-water: 25 section.

[0082] Before giving ink on a textile, the textile which consists of polyester 100% textile fabrics was beforehand dipped in processing liquid (10% of ureas, 2% of sodium alginates, 88% of water), and it dried after dehydration at 30% of contraction percentages.

[0083] On this textile, ink (A) and (B) were printed with the color bubble-jet printer BJC (a trade name, Canon make), respectively, and a total of 24 kinds were produced for the following printing patches in the magnitude of 2x4cm.

[0084] Monochrome printing patch: What printed ink (A) and (B) by each amounts 2, 4, and 6 of ink placing, and 8nl/mm<sup>2</sup>, respectively.

[0085] Color-mixture printing patch: 16 kinds of things which printed ink (A) and (B) in piles in all the combination of the above-mentioned amount of placing (for example, patch which printed the patch and ink (A) which printed ink (A) and ink (B) both by 2 2 nl(s)/mm by 2, and printed ink (B) by 2 2 nl(s)/mm 4 nl(s)/mm).

[0086] Thus, dyeing according the printed textile to steaming processing (the HT steaming method) was performed for 6 - 8 minutes at 160 degrees C, respectively. Subsequently, neutral detergent washed these textiles and the textile-printing object of this invention was obtained.

[0087] The below-mentioned assessment approach estimated the color enhancement of the field of a violet system to the blue system of a textile-printing object, and coloring stability. A result is shown in a table 1. As shown in a table 1, the color enhancement of the field of a violet system to a blue system was good, and, moreover, the coloring stability in the color mixture section also had it. [ good ]

[0088] Example 2 disperse-dye liquid (III) and production of (IV): After having mixed the ligninsulfonic acid sodium 2 section, the ion-exchange-water 73 section, and the diethylene-glycol 15 section, adding the disperse dye 10 following section to this solution and performing

pre mixing for 30 minutes, distributed processing was performed on condition that the following. Disperse dye: C.I. De Dis parsing violet 77 (for color dispersion liquid (III)), C.I. De Dis parsing blue 165 (for color dispersion liquid (IV)), disperser: Sand grinder (product made from Igarashi machine), diameter [ of grinding media: glass bead 0.5mm ], grinding media [ filling factor: 70% of ] (volume), and grinding time amount: 3 hours.

[0089] Subsequently, after performing centrifugal separation processing (for 12000rpm and 20 minutes), it filtered in FURORO pore filter FP-250 (Sumitomo Electric Industries make), the big and rough particle was removed, and disperse dye liquid (III) and (IV) were obtained, respectively.

[0090] Production of ink (C) and (D): The following component was mixed, the acetic acid adjusted this mixed liquor to pH 5-7, and ink (C) and (D) were obtained, respectively. The above-mentioned disperse dye liquid (III) or the (IV):30 section, the thiodiglycol:5 section, the diethylene-glycol:10 section, the tetraethylene glycol wood ether:5 section, the ion-exchange-water:50 section.

[0091] On the same textile as an example 1, the same pattern was printed for ink (C) and (D) by the respectively same approach as an example 1. Subsequently, dyeing by the thermostat sol processing for 40 - 50 seconds was performed at 200 degrees C. Then, neutral detergent washed these textiles and the textile-printing object of this invention was obtained.

[0092] The below-mentioned assessment approach estimated the color enhancement of the field of a violet system to the blue system of a textile-printing object, and coloring stability. A result is shown in a table 1. As shown in a table 1, the color enhancement of the field of a violet system to a blue system was good, and, moreover, the coloring stability in the color mixture section also had it. [ good ]

[0093] Production of example 3 disperse-dye liquid (V) and (VI): After having mixed the beta naphthalene sulfonic-acid formaldehyde condensate 20 section, the ion-exchange-water 50 section, and the diethylene-glycol 10 section, adding the disperse dye 20 following section to this solution and performing pre mixing for 30 minutes, distributed processing was performed on condition that the following. Disperse dye: The C.I. De Dis parsing violet 97 (for color dispersion liquid (V)), the C.I. De Dis parsing blue 79:1 (for color dispersion liquid (VI)), a disperser: pearl mill (Ashizawa make), the diameter of grinding media: glass bead 1mm, filling factor: 50% of grinding media (volume), and regurgitation rate: 10 ml/min.

[0094] Subsequently, after performing centrifugal separation processing (for 12000rpm and 20 minutes), it filtered in FURORO pore filter FP-250 (Sumitomo Electric Industries make), the big and rough particle was removed, and disperse dye liquid (V) and (VI) were obtained, respectively.

[0095] Ink (E) and production of (F): The following component was mixed, the acetic acid adjusted this mixed liquor to pH 5-7, and ink (E) and (F) were obtained, respectively. The above-mentioned disperse dye liquid (V) or the (VI):50 section, the ethylene glycol:5 section, the bis-hydroxyethyl sulfone:18 section, the diethylene-glycol:5 section, the isopropanol pilus alcoholic:3 section, the ion-exchange-water:19 section.

[0096] Before giving ink on a textile, the textile which consists of textile fabrics which mixed polyester 70% and 30% of cotton was beforehand dipped in processing liquid (10% [ of ureas ], and carboxymethyl-cellulose 2%, 88% of water), and it dried after dehydration at 30% of contraction percentages.

[0097] On this textile, the same pattern was printed for ink (E) and (F) by the respectively same approach as an example 1. Subsequently, steaming processing for [ 6 minutes - ] 8 minutes (the HT steaming method) was performed at 160 degrees C. Then, neutral detergent washed this and the textile-printing object of this invention was obtained.

[0098] The below-mentioned assessment approach estimated the color enhancement of the field of a violet system to the blue system of a textile-printing object, and coloring stability. A result is shown in a table 1. As shown in a table 1, the color enhancement of the field of a violet system to a blue system was good, and, moreover, the coloring stability in the color mixture section also had it. [ good ]

[0099] example of comparison 1 disperse-dye liquid (VII) — and (VIII) production: — after having mixed the polyoxyethylene-alkyl-ether sodium-sulfate 5 section, the ion-exchange-water 7

section, and the diethylene-glycol 5 section, adding the disperse dye 15 following section to this solution and performing pre mixing for 30 minutes, distributed processing was performed on condition that the following. Disperse dye: C.I. De Dis parsing red 43 (the filling factor of color dispersion liquid (for VII), the C.I. De Dis parsing blue 81:1 (for color dispersion liquid (VIII)), a disperser:Sand grinder (product made from the Igarashi machine), the diameter of grinding media:zirconium bead 1mm, and grinding media: 50% (volume) and grinding time amount: 3 hours.) [0100] FURORO pore filter FP-250 [ subsequently, ] (Sumitomo Electric Industries make) after performing centrifugal separation processing (for 12000rpm and 20 minutes) — filtration — carrying out — a big and rough particle — removing — disperse dye liquid (VII) — and (VIII) it obtained, respectively.

[0101] Ink (G) and production of (H): The following component was mixed, the acetic acid adjusted this mixed liquor to pH 5-7, and ink (G) and (H) were obtained, respectively. the above-mentioned disperse dye liquid (VII) or (VIII) : — the 40 sections, the bis-hydroxyethyl sulfone:24 section, the diethylene-glycol:11 section, and the ion-exchange-water:25 section.

[0102] On the same textile as an example 1, the same pattern was printed for ink (G) and (H) by the respectively same approach as an example 1. Subsequently, steaming processing for 6 – 8 minutes (the HT steaming method) was performed at 160 degrees C. Then, neutral detergent washed these textiles and the textile-printing object was obtained.

[0103] The below-mentioned assessment approach estimated the color enhancement of the field of a violet system to the blue system of a textile-printing object, and coloring stability. A result is shown in a table 1. As shown in a table 1, moreover, the coloring stability in the color mixture section of the color enhancement of the field of a violet system to a blue system was also bad well.

[0104] Production of example [ of a comparison ] 2 disperse-dye liquid (IX): After having mixed the polyoxyethylene-alkyl-ether sodium-sulfate 5 section, the ion-exchange-water 75 section, and the diethylene-glycol 5 section, adding the disperse dye 15 following section to this solution and performing pre mixing for 30 minutes, distributed processing was performed on condition that the following. Disperse dye: C.I. De Dis parsing red 188 (for color dispersion liquid (IX)), disperser:Sand grinder (product made from Igarashi machine), diameter [ of grinding media:zirconium bead 1mm ], grinding media [ filling factor:50% of ] (volume), and grinding time amount: 3 hours.

[0105] Subsequently, after performing centrifugal separation processing (for 12000rpm and 20 minutes), it filtered in FURORO pore filter FP-250 (Sumitomo Electric Industries make), the big and rough particle was removed, and disperse dye liquid (IX) was obtained.

[0106] Production of ink (I): The following component was mixed, the acetic acid adjusted this mixed liquor to pH 5-7, and ink (I) was obtained. Disperse-dye (Liquid IX): The 40 sections, the bis-hydroxyethyl sulfone:24 section, the diethylene-glycol:11 section, the ion-exchange-water:25 section. [ Above-mentioned ]

[0107] The same pattern was printed for the ink (B) used in ink (I) and the example 1 on the same textile as an example 1 by the same approach as an example 1. Subsequently, steaming processing (the HT steaming method) was performed for 6 – 8 minutes at 160 degrees C. Then, neutral detergent washed this and the textile-printing object was obtained.

[0108] The below-mentioned assessment approach estimated the color enhancement of the field of a violet system to the blue system of a textile-printing object, and coloring stability. A result is shown in a table 1. As shown in a table 1, moreover, the coloring stability in the color mixture section of the color enhancement of the field of a violet system to a blue system was also bad well.

[0109] Production of example [ of a comparison ] 3 disperse-dye liquid (X): After having mixed the beta naphthalene sulfonic-acid formaldehyde condensate 20 section, the ion-exchange-water 50 section, and the diethylene-glycol 10 section, adding the disperse dye 20 following section to this solution and performing pre mixing for 30 minutes, distributed processing was performed on condition that the following. Disperse dye: The C.I. De Dis parsing blue 7 (cyanogen color) (for color dispersion liquid (X)), a disperser:pearl mill (Ashizawa make), the diameter of grinding media:glass bead 1mm, filling factor:50% of grinding media (volume), and regurgitation

rate:100 ml/min.

[0110] Subsequently, after performing centrifugal separation processing (for 12000rpm and 20 minutes), it filtered in FURORO pore filter FP-250 (Sumitomo Electric Industries make), the big and rough particle was removed, and disperse dye liquid (X) was obtained.

[0111] Production of ink (J): The following component was mixed, the acetic acid adjusted this mixed liquor to pH 5-7, and ink (J) was obtained. Disperse-dye (Liquid X): The 50 sections, the ethylene glycol:5 section, the bis-hydroxyethyl sulfone:18 section, the diethylene-glycol:5 section, the isopropanol plus alcoholic :3 section, the ion-exchange-water:19 section. [ Above-mentioned ]

[0112] The same pattern was printed for the ink (E) used in ink (J) and the example 3 on the same textile as an example 3 by the same approach as an example 1. Subsequently, dyeing by the steaming processing for 6 - 8 minutes (the HT steaming method) was performed at 160 degrees C. Then, neutral detergent washed this and the textile-printing object was obtained.

[0113] The following assessment approach estimated the color enhancement of the field of a violet system to the blue system of a textile-printing object, and coloring stability. A result is shown in a table 1. As shown in a table 1, moreover, the coloring stability in the color mixture section of the color enhancement of the field of a violet system to a blue system was also bad well.

[0114] Color enhancement of the field of a violet system to the blue system of the assessment approach textile-printing object: The obtained printing patch was checked with the color chip of Munsell, and that according to which a color is classified into purple and purple blue was chosen. subsequently, each chromaticity  $a^*$  and  $b^*$  of the selected printing patch — the Minolta make — a spectrum — saturation  $C^*$  was computed by having measured by colorimeter CM-2022, and saturation  $C^*$  evaluated by the number of 55 or more things (ten or more: O, 5-9:\*\*, less than [ 5 ]:x). In addition, saturation  $C^*$  is excellent in saturation, so that the numeric value is large, and it can be said for the range of a color expression to be wide. Calculation of saturation  $C^*$  is called for from  $C^*=(a^*)^2+(b^*)^2)^{1/2}$ . Moreover, the color chip of Munsell is an approach for judging the color of an object with a color sample, and the hue is classified into ten kinds, such as blue purple purple blue. In this classification, the color of the field of a violet system to a blue system is contained in purple and purple blue.

[0115] Coloring stability: The K/S value change obtained by the degree type estimated.

$K/S \text{ value} = (1-R)^2/2R$  and R are the reflection factor of the maximum absorption wavelength. K/S value was measured, respectively about what should steaming-processing-carry out steaming processing for 8 minutes for 6 minutes at 160 degrees C about examples 1 and 3 and the examples 1-3 of a comparison, and those differences were seen. K/S value was measured, respectively about what carried out thermostat sol processing for 40 seconds at 200 degrees C about the example 2, and the thing processed for 50 seconds, and those differences were seen. The difference of K/S value exceeded one (the difference by heating conditions is small) or less, the difference of O, and K/S value exceeded 1, and the difference of \*\*, K / S value made x two (the difference by heating conditions is large) or more less than for two (there are some differences by heating conditions).

[0116]

[A table 1]

表 1

	パイロット系からブルー系の領域の発色性	発色安定性
実施例 1	○	○
実施例 2	○	○
実施例 3	○	○
比較例 1	△	×
比較例 2	△	×
比較例 3	×	△

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[Translation done.]

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**DESCRIPTION OF DRAWINGS**

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**[Brief Description of the Drawings]**

[Drawing 1] It is the appearance perspective view of the recording head of the ink jet textile-printing equipment of this invention.

[Drawing 2] It is the A-A line sectional view of drawing 1 of the recording head of the ink jet textile-printing equipment of this invention.

[Drawing 3] It is the B-B line sectional view of drawing 2 of the recording head of the ink jet textile-printing equipment of this invention.

[Drawing 4] It is the explanatory view of the ink jet textile-printing equipment of this invention.

[Drawing 5] It is the sectional view of the ink cartridge of the ink jet textile-printing equipment of this invention.

[Drawing 6] It is the perspective view of the record unit of the ink jet textile-printing equipment of this invention.

**[Description of Notations]**

- 1 Orifice
- 2 Itabe
- 3 Exoergic Head
- 4 Slot
- 5 Protective Coat
- 6a, 6b Aluminum electrode
- 7 Exoergic Resistor Layer
- 8 Accumulation Layer
- 9 Substrate
- 401 Blade
- 402 Cap
- 403 Absorber for Recovery
- 404 Regurgitation Recovery Section
- 405 601 Recording head
- 406 Carriage
- 407 Guide Shaft
- 408 Motor
- 409 Belt
- 410 Grant Section
- 411 Cloth Delivery Roller
- 412 \*\*\*\* Roller
- 501 Ink Hold Section
- 502 Plug
- 503 Waste Ink Absorber
- 602 Atmospheric-Air Free Passage Hole

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**[Translation done.]**



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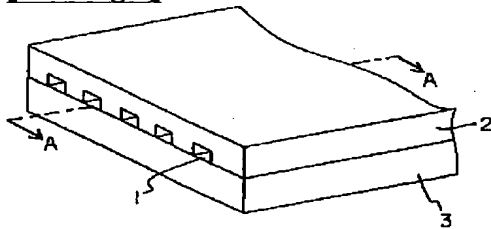
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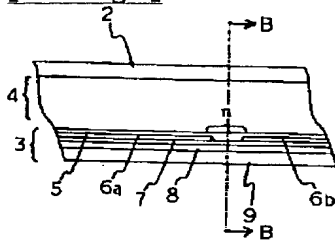
**DRAWINGS**

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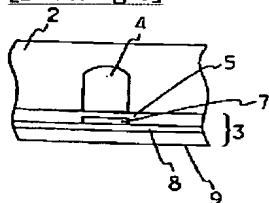
**[Drawing 1]**



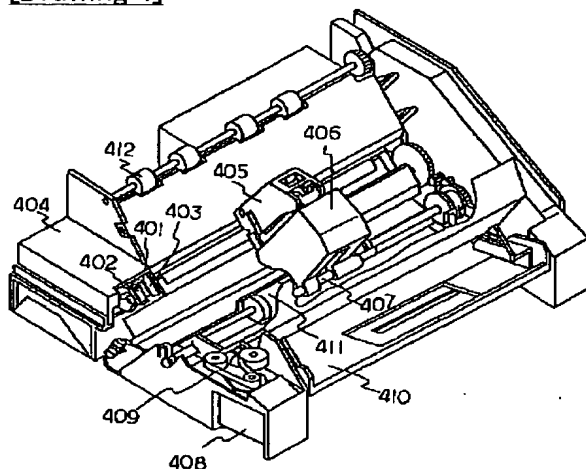
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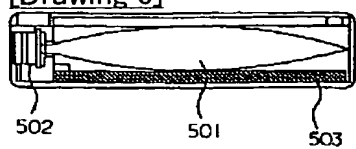
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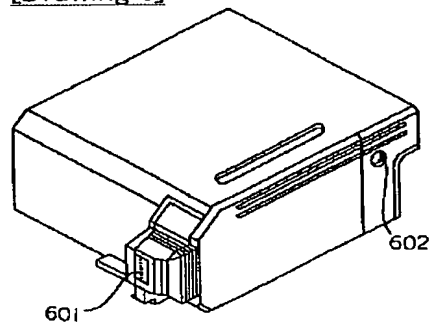
**[Drawing 4]**



[Drawing 5]



[Drawing 6]



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